

# Multi-Purpose Agricultural Vehicle

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**Abstract:** *The paper aims on the design, development and the fabrication of the vehicle which can dig the soil, sow the seeds, leveler to close the soil and pump to spray water, these whole systems of the vehicle works with the battery and solar power, the vehicle is controlled by toggle switch. In recent years the development of the autonomous vehicles in the agriculture has experienced increased interest. The advantages of these vehicles are hands-free and fast input operations. In the field of agricultural autonomous vehicle, a concept is been developed to investigate if multiple small autonomous machine could be more efficient than traditional large tractors and human forces. Keeping the above ideology in mind, a unit with the following feature is designed, Ploughing is one of the first steps in farming. During this process we till the land and make it ready for the seed sowing. By tilling we mean that a plough will be used which will have teeth's like structure at the end and will be able to turn the top layer of soil down and vice-versa. Seed sowing comes next where the seeds need to be put in ground at regular intervals and these needs to be controlled automatically. Limiting the flow of seeds from the seeds chamber is typically doing this. soil leveler is fitted to close the seeds to the soil and to level the ground. Water pump is used to spray the water.*

**Key words:** *Sprayer, Toggle switch, Battery, Solar panel*

## 1. INTRODUCTION

Agriculture is the backbone of India. The history of Agriculture in India dates back to Indus Valley Civilization Era and even before that in some parts of Southern India. Today, India ranks second worldwide in farm output. The special vehicles plays a major role in various fields such as industrial, medical, military applications etc., The special vehicle field are gradually increasing its productivity in agriculture field. Some of the major problems in the Indian agricultural are rising of input costs, availability of skilled labors, lack of water resources and crop monitoring. To overcome these problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their

efforts. The vehicles are being developed for the processes for ploughing, seed sowing, leveling, water spraying. All of these functions have not yet performed using a single vehicle . In this the robots are developed to concentrate in an efficient manner and also it is expected to perform the operations autonomously. The proposed idea implements the vehicle to perform the functions such as ploughing, seed sowing, mud leveling, water spraying. These functions can be integrated into a single vehicle and then performed.

## 2. REASON FOR SELECTING THE PROBLEM

- Lack of mechanization in farming
- Required excess efforts for different process.
- Required more man power.
- Excess time consumption for performing individual process.

## 3. SCOPE OF PRESENT PAPER

The Present project aims at designing an intelligent robotic vehicle which can be controlled by toggle switch, The main aim of our project has been to develop a solar operated digging machine, which is solar powered. In this machine we used a solar panel to capture and convert solar energy into electrical energy which in turn is used to charge a battery, which then gives the necessary power to a shunt wound DC motor. This power is then transmitted to the rear wheel through gear drives. In this project an attempt is made to make the electric and mechanical systems share their powers in an efficient way.

## 4. OBJECTIVES

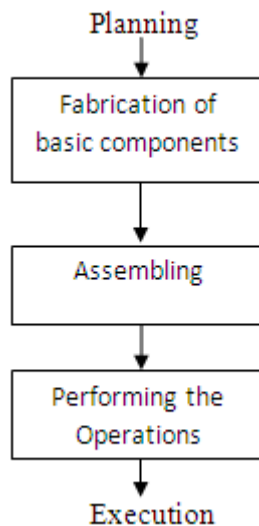
The objective of this paper is to present the status of the current trends and implementation of Agricultural and autonomous systems and outline the potential for future applications. Different applications of autonomous vehicles in agriculture have been examined and compared with

conventional systems and are proved as efficient and effective.

- To reduce human effort in the agricultural field with the use of small robot.
- To perform all 4 operations at single time, hence increases production and saves time.
- To complete large amount of work in less time.
- Farmer can operate this robot through remote by sitting at one side and he can operate easily.
- The usage of solar can be utilized for Battery charging. As the Robot works in the field, the rays of the sun can be used for solar power generation.
- To increase the efficiency, the solar power is used and the Power output can be increased.

Moreover we will give examples of the economic potential of applying autonomous robotic vehicles compared to conventional systems. Focus will be put on potential labor cost savings, farm structure implications and sizes for operation, daily working hours, potential environmental impact, energy costs and safety issues

## 5. METHODOLOGY



The basic aim of this project is to develop a multipurpose machine, which is used for digging the soil, seed sowing, and leveler to close the mud and water sprayer to spray water with least changes in accessories with minimum cost. This whole system of the robot works with the battery and the solar power.

- The base frame is made for the robot with 4 wheels connected and driven the rear wheel is dc motor.
- One end of the frame, cultivator is fitted which is also driven by dc motor and design is made to dig the soil.
- Funnel is made by the sheet metal, to store the seeds and the seeds flow through the funnel through the drilled hole on the shaft to the digged soil.
- On the end leveler is fitted to close the seeds to the soil, and water pump sprayer to spray the water.
- Solar panel is placed on top of the robot and is connected to the battery for charging the battery.
- Thus the max efficiency is utilized from the sun by the solar panel and to the battery
- The whole robot requires the 12v battery to operate the system
- Toggle switches are used to control the operation of the vehicle.



Fig. 1 Fabricated model

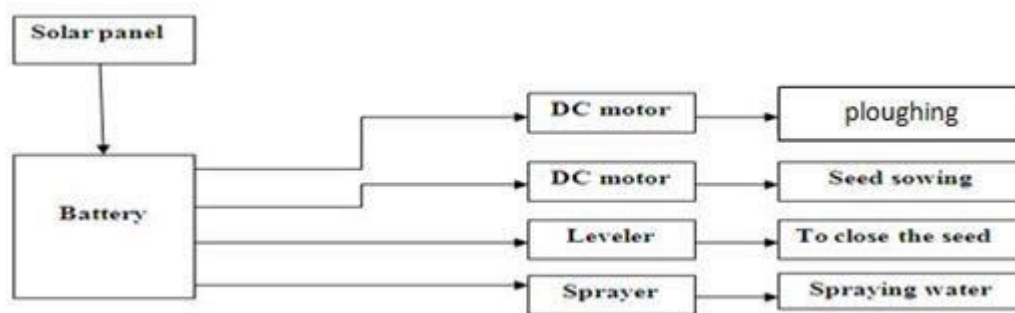


Fig. 2 block diagram of Multi purpose agricultural vehicle

## 6. OPERATIONS

### 6.1. Steering mechanism



Fig. 3 Steering mechanism

The wheel is coupled with the DC Motor, The power for motor is supplied by a Battery, The direction of motor rotation can be controlled by toggle switches for steering the vehicle to either left or right side direction.

The power for motor is supplied by a Battery, A DC Motor shaft is welded to a bolt, & a lead screw is also welded to a bolt, by this arrangement the rotary motion of the motor is converted into linear motion of the lead screw. As the cultivator is welded to the lead screw, it is lowered down, soil is digged to 1.5 mm for one rotation since the lead screw pitch is of 1.5 mm, The direction of motor rotation can be controlled by toggle switch for up and down movement of the cultivator.

### 6.2. Ploughing



Fig. 4 ploughing operation

### 6.3. Seed sowing



Fig. 5 Seed sowing operation

A ladle is used for Seed storage, We have provided hole to the hallow cylinder which is coupled to the DC motor shaft, where the funnel is placed above it, The DC motor is powered by a battery which is controlled using a toggle switch, As the motor is switched on, the hallow cylinder tend to rotate which makes the seeds fall on the cultivated field making consistent gap between seeds

#### 6.4. Leveling



Fig. 6 Leveling operation

A Sheet metal Plate is used as mud closer and leveler, The long bolt and nut is used for leveler up & down movement. The Leveler is not powered, instead it is fixed to required level initially, The leveler closes the soil in the sowed soil & levels the land.

#### 6.5. WATER SPRAYING OPERATION



Fig. 7 Water spraying operation

A water container is used for water storage, A submersible pump is used for pumping water to the water sprayer. The water flows to the sprayer through pipe. The power for pump is supplied by a on and off switch

#### 7. Toggle switch

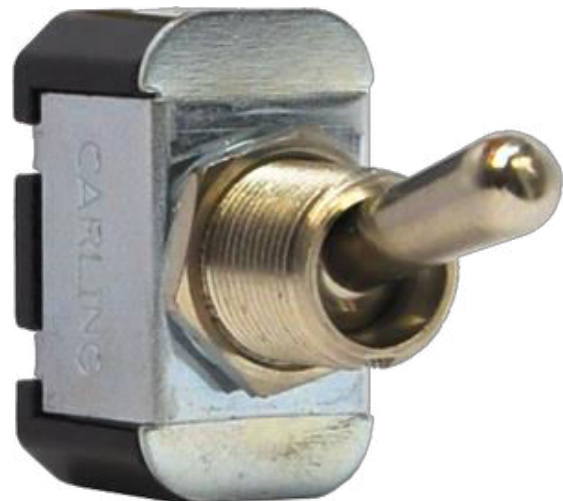


Fig. 8 toggle switch

The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts, which are connected to external circuits. Each set of contacts can be in one of two states: either "closed" meaning the contacts are touching and electricity can flow between them, or "open", meaning the contacts are separated and the switch is nonconducting. The mechanism actuating the transition between these two states (open or closed) can be either a "toggle" (flip switch for continuous "on" or "off") or "momentary" (push-for "on" or push-for "off") type.

A switch may be directly manipulated by a human as a control signal to a system, such as a computer keyboard button, or to control power flow in a circuit, such as a light switch. Switches may be operated by process variables such as pressure, temperature, flow, current, voltage, and force, acting as sensors in a process and used to automatically control a system. For example, a thermostat is a temperature-operated switch used to control a heating process. A switch that is operated by another electrical circuit is called a relay.





A toggle switch in the "on" position. In the simplest case, a switch has two conductive pieces, often metal, called *contacts*, connected to an external circuit, that touch to complete (make) the circuit, and separate to open (break) the circuit. The contact material is chosen for its resistance to corrosion, because most metals form insulating oxides that would prevent the switch from working. Contact materials are also chosen on the basis of electrical conductivity, hardness (resistance to abrasive wear), mechanical strength, low cost and low toxicity.

Sometimes the contacts are plated with noble metals. They may be designed to wipe against each other to clean off any contamination.

## 8. CONCLUSION

After the manufacturing and trial on the "Multipurpose Agricultural Automobile (Farm Machine)" conclusion made are as follows:

- Based on the overall performance of the machine we can definitely say that the project will satisfy the need of small scale farmer, because they are not able to purchase costly agricultural equipment.
- The machine required less man power and less time compared to traditional methods, so if we manufacture it on a large scale its cost gets significantly reduce and we hope this will satisfy the partial thrust of Indian agriculture.
- So in this way we can overcome the labour problem that is the need of today's farming in India.

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